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The Open University of Sri Lanka
B.Sc/B.Ed. Degree Programme, Continuing Education Programme
Applied Mathematics – Level 03
PCU1142/PSU1182/PSE3182/PSZ4182/PSZ3182/NSU1142
Bio Statistics
FINAL EXAMINATION 2009/2010

Duration: - Two Hours.

DATE: - 02/02/2010. **Time: - 1.30 p.m. –3.30 p.m.**

ANSWER FOUR QUESTIONS ONLY
Statistical tables are provided

1. In a study on the effect of a fertilizer on the growth of sunflower plants, a researcher collected information on the following variables.

   V_1 – Age of the plants recorded as
   1 – Less than three months
   2 – Three to five months
   3 – More than five months

   V_2 – soil moisture level recorded as
   1 – Law
   2 – Moderate
   3 – High

   V_3 – Increment in height over a three weeks period

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   i) Classify the variables as discrete vs continuous

   ii) Classify the variables as qualitative vs quantitative

   iii) Classify the data as nominal, ordinal, interval or ratio

   iv) State whether each of the following statements is true or false. In each case, give reasons for your answer.

   a) The bar chart is appropriate to highlight the association between the variables V_1 and V_3.

   b) A histogram is appropriate as a graphical summary to high light whether the data collected on the variable V_3 are symmetrically distributed or not.

   c) A pie chart is appropriate to highlight the dispersion of the data collected on the variable V_2.

2. A researcher claims that the soil PH in a certain area is less than 6.8. The following summary measures were computed based on 50 soil samples randomly collected from this area.

   Sample mean - 6.9
   Sample standard deviation - 2.1

   i) Clearly state the null and the alternative hypothesis he would test in order to examine the validity of the researcher's claim.

   ii) Test the hypothesis using at 5% significant level. Clearly state your findings in relation to this study. Assume that the measurements are normally distributed.

   iii) Explain the following terms in relation to this study?

      a) Significance level
      b) Type 1 error

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3. The following table summarizes the times taken (in days) to blossom by 150 randomly selected tomato plants of a newly develop variety.

Time taken (in days)	No of plants
45-54	23
55-64	37
65-74	64
75-84	26

   i) Give an estimate for the expected time taken by a randomly chosen tomato plants of the set variety to blossom.

   ii) Compute the 1st quartile. Describe what it measures in relation to this study.

   iii) Compute an estimate for the proportion of tomato plants that take more than 60 days to blossom.

   iv) What is the relative cumulative frequency corresponding to the second class interval? In relation to this study what does it measure?

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4. Comment on the following.

   a) A disease has just begun to spread over a banana cultivation of three acres in extend that makes the leaves yellow. The color of leaves indicates that already affected plants are clustered together. The owner of the banana cultivation claims that altogether there are 3500 banana plants in the 3-acre area. A researcher interested in estimating the number of plants that are already affected suggests that a simple random sampling plan is appropriate.

   b) Non sampling error can always be reduced by increasing the sample size.

   c) A researcher wants to estimate the proportion of consumers who prefer three brands of soap in a population. The researcher suspects that the preference depends on the age of the consumer classified as young or adults. The researcher suggests that cluster sampling is appropriate for sampling consumers for this study.

   d) In random sampling each experimental unit in the population has the same chance to be included in the sample.

   e) All ordinal data are qualitative.

5. The following table summarizes the temperature readings (in centigrade) of hundred samples collected in an experiment.

Temperature (In centigrade)	**No of samples**
10-14	18
15-19	21
20-24	37
25-29	24

   i) Find the sample standard deviation. In relation to this study, what does it measure?

   ii) Find the coefficient of variation of the data.

   iii) Find the range of the data

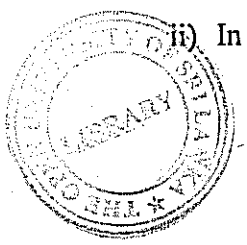
   iv) Find the mode of the data.

   v) State whether each of the measures computed in part (i) to (iv), can be used as a measure of dispersion of the data or not.

6. A researcher is interested in comparing the effects of to catalysts on the yield of a chemical reaction. He suspects that the yield and the appropriate catalyst may depend on the temperature of the sample. He is particularly interested in three temperatures 10°C, 30 °C and 60 °C. For this study, the researcher has resources to prepare 60 samples. Two experimenters are available for the study who may defer in the accuracy of readings they collect.

   i) Briefly explain how you would design this study. If you use the random number table, clearly explain how you use it.

   ii) In relation to this study, explain the following terms.
      a). Random variation
      b). Interaction
      c). Treatment



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